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Evaluation of the State Personal Income Estimates

THIS article presents the results of a BEA study of the reliability of the quarterly and annual estimates of State personal income. The study, which covered estimates for 1980–87, assessed reliability using several statistical measures to examine the size of the revisions made to the estimates. The findings of this study are intended to help users determine the suitability for their purposes of the estimates released at different stages of the estimating process (see the box on page 21 for a description of some of the uses of the State estimates). The following summarizes the principal findings of the study:

- The major sources of the revisions to the quarterly percent changes in the preliminary quarterly estimates of State personal income are farm proprietors' income and wages and salaries.
- Largely reflecting wages and salaries, the preliminary quarterly estimates of total personal income tend to be underestimated in fast-growing States and overestimated in slow-growing States.
- Beginning in 1984, the reliability of the second quarterly estimates was improved by the incorporation of quarterly data from employers' payroll tax reports.
- The annual revisions of total personal income are smaller than the quarterly revisions.

The first section of this article provides an overview of the sources and methods for the State personal income estimates. The second section presents the revision measures and the findings of the study. The third section describes some changes in the estimating procedures that have been made since the period covered by the study.

Overview of Sources and Methods

The quarterly and annual estimates of State personal income are subject to refinements as BEA incorporates source data that are more complete, more detailed, or otherwise more appropriate than the information previously available. These source data are incorporated at specific stages in the estimating process, and successive estimates are released according to a set schedule.

Because the quarterly State estimates are tied to the annual estimates that incorporate more detailed and more reliable source data, the quarterly estimates for all components are interpolations or extrapolations of the annual estimates. The State quarterly source data are used as indicators for the interpolation or extrapolation. In addition, the quarterly State estimates are controlled to the personal income total in the national income and product accounts (NIPA's).

A detailed statement of the sources and methods used for the annual and quarterly State personal income estimates is presented in *State Personal Income: 1929-87*. (Ordering information appears on the inside back cover of this issue.) A revised description of the source data and methods used for the State wage and salary estimates was presented in "State Estimates of Wages and Salaries: A Methodological Update," in the October 1989 SURVEY OF CURRENT BUSINESS.

Revision schedule for State estimates

The "preliminary" quarterly estimates of State personal income are released 4 months after the close of the quarter. The "second" quarterly estimates are released 3 months later. In October and again the following April, the quarterly estimates for the preceding 3 years are revised to reflect revisions to the annual estimates; the "final" quarterly estimates used in the study were the most recent estimates available in early 1989, when the study began.

The "preliminary" annual estimates of State personal income, which are based on the current quarterly estimates, are released in April, 4 months after the close of the year. Revised annual estimates, which are developed independently of and are prepared in greater component detail than the quarterly estimates, are released 4 months later, in August. For several succeeding years, the annual estimates are again revised in April and in August, as additional data become available; the "final" annual estimates used in this study were the most recent estimates available in early 1989.

Sources of revision

Revisions to the quarterly State estimates stem from three main sources: (1) Incorporation of new or revised quarterly State indicators, (2) revision of the national controls from the NIPA's and of the annual State estimates, and (3) revision of the seasonal factors. Any of these factors can affect a particular quarter's revision. Revisions to the annual estimates stem from the incorporation of additional source data or from revisions of the national controls from the NIPA's.

Table 1 provides a brief summary of the primary sources for (1) the preliminary quarterly estimates, (2) the second quarterly estimates, and (3) the detailed annual State estimates. The primary sources for the major components of State personal income are discussed in this section.

Wages and salaries.—Most of the preliminary quarterly estimates of wages and salaries are extrapolations based on Bureau of Labor Statistics (BLS) 790 State employment data at the Standard Industrial Classification

(SIC) division level. For durable and nondurable manufacturing, the extrapolation indicator is the product of employment data and production workers' hours and earnings. The BLS-790 is a monthly survey of employment, average weekly hours, and average hourly earnings that is conducted in cooperation with the State employment security agencies. Data are collected for the pay period that includes the 12th of each month from a sample of over 300,000 nonagricultural establishments. For the States, employment data, but not hours and earnings data, are available at the SIC division level; employment data and, for production workers, hours and earnings data are available for durable and nondurable manufacturing. The BLS-790 State data are available to BEA 6 weeks after the close of the month.

Except for coverage differences, such as the exclusion of wages and salaries of U.S. citizens stationed abroad, the State quarterly estimates of wages and salaries are controlled to—that is, they sum to—the NIPA estimates of wages and salaries released by BEA 3 months after the close of the quarter. (For a detailed description of the differences between State and national estimates of personal income, see table 1 in "State Estimates of Wages and Salaries: A Methodological Update," in the October 1989 SURVEY.) The NIPA estimates are based on more complete national BLS-790 information. Data at the two-digit SIC level on employment and, for production and nonproduction workers, on average weekly hours and average hourly earnings are included in the national wage and salary estimates.

For the nonmanufacturing industries, employment is a reliable indicator for State wages and salaries when average wage rates and hours worked are stable or when they change similarly in all States. However, average wage rates and hours worked can change differently among States. In addition, the employment estimates available for the first quarterly State personal income estimates are subject to revision because they are based on a sample survey, and that sample may not accurately reflect employment changes associated with births of firms.

In manufacturing, the data available for estimating preliminary quarterly State wages and salaries in manufacturing include wage-rate information in the form of average weekly hours and average hourly earnings for production workers. However, these source data do not cover wages and salaries for nonproduction workers; they also exclude profit-sharing and other lump-sum payments for all workers. These gaps in coverage have become more significant as the number of production workers relative to nonproduction workers has declined and as wage payments based on profit-sharing programs have become more common in all industries, including manufacturing.

In the second quarterly estimates of wages and salaries, quarterly data from the ES-202 employers' payroll tax reports replace the BLS-790 data as the extrapolator. The second quarterly estimates are controlled to the same NIPA wage and salary estimates as the preliminary quarterly estimates. The ES-202 reports, covering 96 percent of all wages and salaries, summarize returns that are required of all employers covered by State unemployment insurance law and by the unemployment compensation program for Federal employees; thus, these reports provide a virtual census of nonagricultural employment and wages. The data are at the four-digit SIC level of industry detail, by State and county, and they are made available to BEA 5 months after the close of the quarter.

Quarterly wage and salary estimates are adjusted to remove seasonal patterns by using, in most cases, the Census X-11 ARIMA seasonal adjustment method. Although the seasonal patterns are usually stable, they sometimes change rapidly and lead to substantial revisions in the seasonal factors when they are updated to reflect the latest year's data. Lump-sum payments, which are included in wages and salaries, have caused large revisions in the seasonal factors. Payments in certain industries will be discussed later in more detail.

The preliminary annual State estimates of wages and salaries are derived from the quarterly State estimates released each April. At that time, the estimates for the first three quarters of the calendar year are based on ES-202 data, and the estimate for the fourth quarter is based on BLS-790 data. These annual estimates are controlled to the BLS-790-based annual NIPA estimates released 3 months after the close of the year.

BEA's final State annual estimates for most of wages and salaries are based on data from the ES-202 reports and are prepared at the SIC two-digit level of industry detail. These annual estimates are controlled to the revised NIPA estimates released in July, which incorporate ES-202 data. The final quarterly estimates incorporate these final State and national annual estimates.

Farm proprietors' income.—For the preliminary quarterly, second quarterly, and final quarterly estimates, monthly data on farm subsidy payments by State from the U.S. Department of Agriculture (USDA) are used as the quarterly indicator for the government payments portion of

Uses of the State Personal Income Estimates

State personal income is a comprehensive and timely indicator of each State's economy. Most State governments use personal income and its components to forecast sales taxes and personal income taxes. Moreover, 16 States have set constitutional or statutory limits on State government revenue and spending that are tied to State personal income or to one of its components. [1] These 16 States—Arizona, California, Hawaii, Idaho, Louisiana, Massachusetts, Michigan, Missouri, Montana, New York, Oregon, South Carolina, Tennessee, Texas, Utah, and Washington— account for nearly one-half of the U.S. population. Some of these States use BEA's annual State personal income estimates; the others use fiscal year estimates derived from BEA's quarterly State personal income estimates. For example, New York, the most recent addition to this list of States that link revenue and spending to personal income, has established a statutory spending target for fiscal year 1991–92 that is tied to the growth in fiscal year State personal income.

The Federal Government uses BEA's estimates of State personal income to determine fund allocations, the largest of which, at approximately $55 billion, are the Federal matching portions for the medicaid and the aid to families with dependent children programs. In addition, the estimates are used in economic impact evaluations, such as those for military base closings.

The private sector also uses BEA's estimates of State personal income. For example, businesses use them to evaluate markets for new or established products and to determine areas for location, expansion, and contraction of their activities; trade associations and labor organizations use them for product and labor market analyses.

1. Advisory Commission on Intergovernmental Relations (ACIR), *Significant Features of Fiscal Federalism, Volume 1: Budget Processes and Tax Systems,* M-169 (January 1990): 10-13. (Since the release of the ACIR publication, New York has established a State government spending target that is tied to personal income.)

Table 1.—Sources of the Estimates for State Personal Income

Components of personal income	Preliminary quarterly	Second quarterly	Final annual
Wages and salaries:			
Farm	Trend extrapolation based on the relationship between annual State and annual national estimates.	Trend extrapolation based on the relationship between annual State and annual national estimates.	USDA.
Agricultural services, forestry, fisheries, and other.	Trend extrapolation based on the relationship between annual State and annual national estimates.	Quarterly ES-202 wages and salaries	Annual ES-202 wages and salaries and BEA data.
Mining	BLS-790 monthly employment data	Quarterly ES-202 wages and salaries	Annual ES-202 wages and salaries.
Construction	BLS-790 monthly employment data	Quarterly ES-202 wages and salaries	Annual ES-202 wages and salaries.
Manufacturing:			
Nondurables	BLS-790 monthly employment data and BLS-790 average weekly hours and average hourly earnings data for production worker.	Quarterly ES-202 wages and salaries	Annual ES-202 wages and salaries.
Durables	BLS-790 monthly employment and production worker average weekly earnings data	Quarterly ES-202 wages and salaries	Annual ES-202 wages and salaries.
Transportation and public utilities:			
Excluding railroads	BLS-790 monthly employment data	Quarterly ES-202 wages and salaries	Annual ES-202 wages and salaries.
Railroads	AAR monthly Class I railroad payroll	AAR monthly Class I railroad payroll	AAR annual payroll data.
Wholesale trade	BLS-790 monthly employment data	Quarterly ES-202 wages and salaries	Annual ES-202 wages and salaries.
Retail trade	BLS-790 monthly employment data	Quarterly ES-202 wages and salaries	Annual ES-202 wages and salaries.
Finance, insurance, and real estate.	BLS-790 monthly employment data	Quarterly ES-202 wages and salaries	Annual ES-202 wages and salaries.
Services	BLS-790 monthly employment data	Quarterly ES-202 wages and salaries	Annual ES-202 wages and salaries, *CBP*, and Census Bureau population data.
Federal civilian	BLS-790 monthly employment data	BLS-790 monthly employment data	Annual ES-202 wages and salaries.
Federal military:			
Active duty	DOD payroll outlays	DOD payroll outlays	DOD payroll outlays.
Reserves	Trend extrapolation based on the relationship between annual State and annual national estimates.	Trend extrapolation based on the relationship between annual State and annual national estimates.	DOD payroll outlays.
State and local government	BLS-790 monthly employment data	Quarterly ES-202 wages and salaries	Annual ES-202 wages and salaries, and Census Bureau data.
Other labor income by SIC division.	BEA wages and salaries by SIC division	BEA wages and salaries by SIC division	BEA wages and salaries, BEA employment, and other agencies' sources.
Proprietors' income:			
Farm	USDA cash receipts, government subsidies	USDA cash receipts, government subsidies	USDA estimates of annual income and expenses.
Nonfarm:			
Construction	BEA wages and salaries	BEA wages and salaries	IRS and *CBP* data.
All other by SIC division	Trend extrapolation based on the relationship between annual State and annual national estimates.	Trend extrapolation based on the relationship between annual State and annual national estimates.	IRS, *CBP*, and AMA data.
Personal contributions for social insurance.	BEA total wages and salaries	BEA total wages and salaries	SSA and Census Bureau data.
Residence adjustment	BEA wages and salaries by SIC division	BEA wages and salaries by SIC division	IRS and Census Bureau data.
Personal dividend income	Trend extrapolation based on the relationship between annual State and annual national estimates.	Trend extrapolation based on the relationship between annual State and annual national estimates.	IRS data
Personal interest income	Trend extrapolation based on the relationship between annual State and annual national estimates.	Trend extrapolation based on the relationship between annual State and annual national estimates.	IRS data.
Rental income of persons	Trend extrapolation based on the relationship between annual State and annual national estimates.	Trend extrapolation based on the relationship between annual State and annual national estimates.	IRS and Census Bureau data.
Transfer payments:			
Excluding unemployment insurance benefits.	Trend extrapolation based on the relationship between annual State and annual national estimates.	Trend extrapolation based on the relationship between annual State and annual national estimates.	SSA, HCFA, Census Bureau, DVA, and other agencies' sources.
Unemployment insurance benefits	ETA	ETA	ETA.

AAR Association of American Railroads
AMA American Medical Association
BLS-790 Monthly survey of establishment employment conducted by the Bureau of Labor Statistics (BLS).
CBP *County Business Patterns* (Published by the Census Bureau)
DOD Department of Defense
DVA Department of Veterans Affairs
ES-202 Tabulations of wages reported on employers' unemployment insurance tax returns (provided to BEA by BLS)
ETA Employment and Training Administration
HCFA Health Care Financing Administration
IRS Internal Revenue Service
SSA Social Security Administration
USDA U.S. Department of Agriculture

net farm proprietors' income. Because no monthly or quarterly State data exist for the detailed components of production expenses and inventory change, monthly data on cash receipts from farm marketings are used as the quarterly indicator for net farm proprietors' income excluding government payments for all three stages of the quarterly estimates.

The preliminary annual estimates of total net farm income (gross farm income less production expenses) are based on the USDA State estimates adjusted for definitional differences. The BEA State annual estimates of net farm proprietors' income are obtained by deducting BEA State estimates of net corporate farm income from BEA State estimates of total net farm income.

The final annual estimates of farm proprietors' income are based on revised annual State income and expense data from USDA.

Because no quarterly State data for farm production expenses or inventory changes exist, the subsequent incorporation of annual State data for these items can cause substantial revisions in the quarterly estimates of State farm proprietors' income. Although farm proprietors' income amounts to only about 1 percent of personal income for the Nation, it is very important in a number of States. In fact, as the analysis in the next section shows, many of the largest revisions in percent changes in total personal income are in these States.

Components based on wages and salaries.—In the preliminary quarterly, second quarterly, and final quarterly estimates, the State wage and salary estimates are used as the indicators for the residence adjustment and for those components that are closely related to wages and salaries: Other labor income, the construction portion of proprietors' income, and personal contributions for social insurance. For personal contributions, total wages and salaries are used as the quarterly indicator; for construction proprietors' income, construction wages and salaries are used; for the residence adjustment and for other labor income, wages and salaries for each SIC division are used.

The preliminary annual estimates are derived from the quarterly estimates released each April. The final annual estimates are based on annual source data from a variety of agencies.

Because the quarterly estimates of these components are based on wages and salaries, revisions in these components reflect revisions to the quarterly wage and salary estimates as well as the incorporation of annual source data.

Components based on annual trends.—No quarterly State indicators exist for the following components of personal income: Farm wages; pay of military reserves; nonfarm proprietors' income excluding construction proprietors' income; dividends, interest, and rent; and transfer payments excluding unemployment insurance benefits. For these components, which amount to about 37 percent of personal income for the Nation, quarterly State indicators are based on trend changes in State shares of the national total; the trend line is estimated using the latest 5 years of annual State and national estimates.

The preliminary annual estimates for these components are derived from the quarterly estimates released each April. The final annual estimates are based on annual source data from a variety of agencies.

For the components that are based on annual trends, revisions result from the incorporation of the annual NIPA and State estimates. Most of these components are driven by national, rather than local, economic conditions. The quarterly State estimating procedure distributes these revisions smoothly across the quarters.

Dividends, interest, and rent amount to nearly 17 percent of personal income for the Nation; over four-fifths of this component is interest payments. Because the largest capital markets are national, fluctuations in rates of return generally are determined more by national than by local economic conditions. Interest rates, for example, tend to fluctuate throughout the country in response to changes in Federal monetary policy. Moreover, residents of a State need not invest their savings locally. Thus, individual State shares of national dividends, interest, and rent are unlikely to change sharply from quarter to quarter in response to local economic conditions.[1]

Transfer payments excluding unemployment insurance benefits amount to about 14 percent of personal income for the Nation. Over two-thirds of these transfers are social security benefits and other Federal retirement-related transfers for which State shares do not vary much from quarter to quarter. Public assistance payments (for example, supplemental security income, aid to families with dependent children, and food stamps) are more sensitive to local economic conditions, so quarterly extrapolations of these payments are subject to greater errors than are the extrapolations of retirement-related transfer payments. However, public assistance payments amount to less than one-fifth of total transfer payments and less than 3 percent of personal income for the Nation.

The personal income components for which trend extrapolation is likely to be least satisfactory are farm wages and nonfarm proprietors' income. Farm wages amount to about 0.2 percent of personal income for the Nation, and nonfarm proprietors' income amounts to about 7 percent. Over one-half of nonfarm proprietors' income consists of professional and other services, which are likely to have reasonably stable trends in the State shares of nonfarm proprietors' income for the Nation; however, proprietors are also important in a number of industries—such as mining, forestry and fisheries, and real estate—that can be quite volatile and that vary substantially from State to State.

Revision Measures and Findings of the Study

The reliability of the quarterly State personal income estimates is determined by the accuracy of the final estimates and the size of the revisions to the preliminary and second estimates. Errors in the final estimates arise mostly from causes that do not easily lend themselves to error quantification—for example, data gaps and nonsampling errors in source data. Consequently, this study considered reliability as reflected in measures of revision.

The study examined the size of the revisions in three State aggregates—personal income, nonfarm personal income, and wages and salaries—between the preliminary, second, and final estimates of quarterly change and

1. However, quarterly State estimates of rent can be greatly affected by disasters such as hurricanes. Rent, as defined by BEA, includes the writing-off of destroyed residential properties. Special, State-specific adjustments are estimated for each of these disasters and added to the appropriate quarter.

the preliminary and final estimates of annual change.[2]

Revision measures

Revisions can be measured in several ways. This study used the same measures that BEA has used to study revisions to the estimates of GNP and its components.[3] One measure analyzes the range of revisions, where revision is defined as the percent change in the final estimates minus the percent change in the preliminary estimates. Typically, ranges covering two-thirds and nine-tenths of the revisions are presented.

Other sets of measures-dispersion, relative dispersion, bias, and relative bias—provide summary measures that are defined as follows: Let P represent the percent change in the preliminary estimates, F the percent change in the final estimates, and n the number of observations.

2. The preliminary, second, and final estimates of quarterly change for all components of personal income are available upon request. This information includes wages and salaries and earnings (wages and salaries plus other labor income and proprietors' income) by SIC division.

3. For a discussion of these measures, see Allan H. Young, "Evaluation of the GNP Estimates," SURVEY 67 (August 1987): 18–42; and Gerald F. Donahoe, "Updated Measures of Revision for Quarterly GNP Estimates," SURVEY 70 (April 1990): 27.

Table 2.—Measures of Revisions in Quarterly Percent Changes in State Personal Income, 1980–87

[Revisions are from preliminary to final]

	Percentage points										Percent					
	Ranges						Dispersion			Bias			Relative dispersion			Relative bias		
	Total personal income		Nonfarm personal income		Wages and salaries													
	Two-thirds of revisions	Nine-tenths of revisions	Two-thirds of revisions	Nine-tenths of revisions	Two-thirds of revisions	Nine-tenths of revisions	Total personal income	Nonfarm personal income	Wages and salaries	Total personal income	Nonfarm personal income	Wages and salaries	Total personal income	Nonfarm personal income	Wages and salaries	Total personal income	Nonfarm personal income	Wages and salaries
United States	**−0.1 to 0.5**	**−0.7 to 0.8**	**−0.2 to 0.4**	**−0.5 to 0.6**	**−0.1 to 0.5**	**−0.3 to 0.8**	**0.4**	**0.3**	**0.3**	**−0.1**	**−0.1**	****−0.2**	**18.8**	**15.4**	**16.2**	**−6.5**	**−5.4**	**−10.6**
New England	−.3 to 1.1	−.5 to 1.1	−.3 to 1.0	−.4 to 1.2	−.1 to 1.5	−1.0 to 1.8	.6	.6	.9	**−.4	**−.4	**−.6	25.4	25.4	38.2	−16.9	−16.7	−24.8
Connecticut	−.2 to 1.1	−.8 to 2.1	−.3 to 1.0	−.8 to 2.1	−.2 to 1.6	−1.1 to 2.6	.7	.7	1.1	*−.4	*−.4	**−.6	30.0	29.7	47.8	−17.0	−16.7	−27.2
Maine	−.5 to 1.2	−1.0 to 1.4	−.6 to .9	−1.3 to 1.5	−1.0 to 1.7	−1.7 to 2.2	.7	.7	1.2	−.3	−.3	−.4	32.0	33.7	57.7	−12.1	−12.3	−21.0
Massachusetts	−.2 to 1.0	−.8 to 1.4	−.2 to 1.0	−.8 to 1.4	−.3 to 1.6	−1.6 to 2.0	.6	.6	.9	**−.4	**−.4	**−.6	28.5	28.3	40.2	−17.6	−17.4	−24.3
New Hampshire	−.4 to 1.5	−1.3 to 1.9	−.4 to 1.5	−1.2 to 1.9	−.7 to 1.9	−1.9 to 3.2	1.1	1.1	1.4	*−.5	*−.5	*−.7	40.4	40.5	48.9	−19.5	−19.5	−24.0
Rhode Island	−.7 to .9	−1.0 to 1.4	−.7 to .9	−1.0 to 1.3	−.6 to 1.4	−1.3 to 2.3	.7	.7	1.0	−.2	−.2	−.4	33.8	33.4	51.5	−12.5	−11.7	−22.0
Vermont	−.8 to 1.4	−1.0 to 1.9	−.5 to 1.4	−1.2 to 1.7	−.7 to 1.9	−2.1 to 2.7	.8	.8	1.2	−.3	*−.3	*−.5	39.5	36.5	53.9	−15.5	−15.9	−23.5
Mideast	−.1 to .6	−.3 to .7	−.1 to .6	−.3 to .7	.1 to .7	−.2 to .8	.3	.3	.5	**−.2	**−.2	**−.3	17.3	17.2	24.8	−11.9	−11.4	−17.5
Delaware	−1.1 to 1.7	−1.8 to 2.9	−1.0 to 1.6	−1.5 to 2.2	−1.3 to 2.8	−3.1 to 3.4	1.3	1.1	1.7	−.4	−.3	−.3	60.3	54.1	89.0	−21.2	−16.9	−17.7
District of Columbia	−.2 to .9	−1.0 to 1.1	−.2 to .9	−1.0 to 1.1	−.6 to 1.3	−1.3 to 1.8	.5	.5	.8	−.2	−.2	−.3	28.1	28.1	48.9	−10.1	−10.1	−16.7
Maryland	−.2 to 1.0	−.6 to 1.2	−.2 to 1.1	−.5 to 1.2	−.2 to 1.4	−.8 to 1.6	.6	.6	.7	**−.4	**−.4	**−.5	28.1	27.2	32.8	−19.2	−18.5	−24.4
New Jersey	0 to .8	−.4 to 1.3	0 to .8	−.3 to 1.2	−.2 to 1.3	−1.0 to 1.7	.5	.5	.8	**−.4	**−.4	*−.4	21.0	20.5	36.8	−16.5	−16.3	−18.6
New York	−.3 to .6	−.4 to .8	−.3 to .6	−.5 to .9	0 to .8	−.6 to 1.2	.4	.4	.6	*−.2	−.2	**−.4	20.8	21.1	27.2	−9.1	−9.1	−17.7
Pennsylvania	−.4 to .6	−1.0 to .9	−.4 to .6	−.8 to .9	−.5 to .8	−.9 to 1.5	.5	.4	.6	−.1	−.1	−.2	27.9	27.7	40.6	−8.2	−6.7	−11.0
Great Lakes	−.6 to .5	−1.0 to .6	−.6 to .3	−.9 to .6	−.6 to .5	−.8 to .7	.4	.4	.5	.1	.1	0	26.6	23.9	32.2	6.1	6.7	3.3
Illinois	−1.0 to .5	−1.9 to 1.5	−.5 to .5	−1.2 to .9	−.9 to .8	−1.4 to 1.4	.8	.5	.7	0	0	−.1	45.7	33.4	46.7	.8	1.8	−5.6
Indiana	−.8 to .5	−1.3 to 1.7	−.8 to .5	−.9 to 1.1	−.6 to .7	−1.7 to 1.7	.7	.5	.7	.1	.1	.1	38.7	30.6	40.3	4.8	5.9	3.9
Michigan	−.9 to 1.0	−1.7 to 1.4	−.9 to 1.0	−1.8 to 1.3	−1.6 to 1.5	−2.4 to 1.9	.8	.9	1.2	.2	.2	.1	48.6	51.0	68.1	15.2	14.7	8.7
Ohio	−.7 to .4	−1.0 to .6	−.5 to .4	−1.2 to .6	−.8 to .6	−1.7 to .9	.4	.4	.6	.1	.1	.1	27.6	27.8	38.7	7.5	8.0	10.6
Wisconsin	−.8 to .6	−1.3 to 1.2	−.5 to .5	−.9 to .7	−.7 to .6	−.9 to .9	.7	.4	.6	0	0	0	39.7	25.8	37.9	2.0	3.0	1.7
Plains	−1.6 to 1.2	−2.1 to 2.0	−.5 to .4	−.8 to 1.0	−.4 to .6	−.7 to .8	1.1	.4	.4	0	0	−.1	45.7	24.6	26.7	−.1	−.1	−5.9
Iowa	−3.4 to 2.3	−4.2 to 3.2	−.9 to .8	−1.3 to 1.3	−1.0 to .8	−1.3 to 1.2	2.1	.8	.7	.1	.1	0	54.6	57.1	59.1	8.3	7.8	−.4
Kansas	−1.2 to 1.5	−2.7 to 3.6	−.6 to .5	−.9 to 1.1	−.7 to 1.1	−1.6 to 1.6	1.4	.5	.8	0	0	−.1	63.7	33.8	54.3	−2.4	1.2	−5.8
Minnesota	−1.3 to .8	−1.6 to 1.7	−.5 to .5	−.6 to .8	−.6 to 1.0	−1.1 to 1.1	.9	.4	.6	0	0	−.1	40.7	24.0	36.8	−1.1	−2.6	−7.9
Missouri	−.7 to 1.0	−1.3 to 1.3	−.4 to .7	−.7 to 1.1	−.5 to .8	−1.2 to 1.2	.7	.5	.6	−.1	−.1	−.2	39.4	28.1	39.2	−8.2	−5.6	−10.0
Nebraska	−2.4 to 2.2	−4.8 to 4.1	−.9 to .4	−1.0 to .9	−.7 to .5	−1.0 to 1.0	2.1	.6	.5	.1	.2	0	49.2	40.1	40.1	5.4	11.4	3.7
North Dakota	−3.2 to 3.7	−15.8 to 8.1	−1.1 to .8	−1.4 to 1.1	−1.3 to .8	−1.7 to 1.4	4.1	.7	.8	.4	.1	.2	69.0	49.0	62.6	22.4	10.1	17.2
South Dakota	−2.6 to 2.8	−4.4 to 3.4	−1.1 to .6	−1.2 to .9	−.9 to .9	−1.9 to 1.7	2.2	.6	.8	−.1	.1	0	55.3	42.8	57.8	−4.8	4.5	1.5
Southeast	−.2 to .7	−.6 to 1.1	−.2 to .5	−.6 to .6	−.2 to .6	−.4 to .9	.5	.4	.4	*−.2	*−.2	*−.2	23.5	17.8	19.5	−10.2	−7.4	−11.2
Alabama	−.8 to 1.0	−1.3 to 1.6	−.3 to .6	−.9 to 1.0	−.6 to 1.1	−1.0 to 1.5	.7	.5	.8	−.2	−.2	*−.4	42.0	28.8	47.1	−13.5	−9.6	−21.3
Arkansas	−1.4 to 1.0	−2.2 to 2.2	−.6 to .4	−1.1 to .6	−.7 to .4	−1.7 to 1.2	1.1	.4	.5	−.1	.2	.1	48.6	26.0	33.1	−6.3	9.3	5.8
Florida	−.6 to 1.0	−1.0 to 1.2	−.6 to .8	−.9 to 1.2	−.2 to .6	−.5 to .9	.7	.6	.5	−.2	−.1	−.2	27.8	23.5	18.2	−6.2	−5.8	−7.1
Georgia	−.1 to 1.1	−.7 to 1.6	−.1 to .9	−.6 to 1.2	−.2 to 1.2	−1.0 to 1.9	.8	.6	.8	**−.5	**−.4	**−.5	31.0	26.7	31.9	−18.6	−15.5	−20.6
Kentucky	−.8 to 1.0	−1.3 to 1.8	−.8 to .9	−1.1 to 1.6	−.8 to .8	−2.7 to 2.3	.9	.7	1.0	−.2	0	−.1	50.3	40.2	61.4	−9.9	−2.6	−5.2
Louisiana	−.6 to .5	−1.2 to 1.2	−.7 to .4	−1.2 to 1.0	−1.0 to .7	−2.1 to 1.5	.6	.5	.9	.1	.2	.2	35.6	35.2	53.9	9.1	11.2	19.4
Mississippi	−1.0 to 1.2	−2.0 to 2.0	−.6 to .6	−.8 to .8	−.6 to 1.1	−1.5 to 1.3	1.1	.4	.7	−.1	0	−.1	51.2	26.7	46.0	−7.1	2.3	−4.2
North Carolina	−.6 to 1.1	−1.1 to 1.7	−.2 to .8	−.7 to 1.3	−.5 to 1.0	−.9 to 1.8	.8	.5	.8	*−.4	*−.3	*−.4	36.6	24.0	36.1	−17.7	−12.4	−16.8
South Carolina	−.6 to .8	−1.2 to 1.6	−.6 to .6	−1.0 to 1.1	−.7 to 1.0	−1.2 to 1.7	.6	.5	.7	−.1	−.1	−.1	30.8	25.9	38.1	−6.8	−4.6	−6.5
Tennessee	−.5 to .8	−1.1 to 1.4	−.4 to .8	−.8 to .8	−.4 to .9	−.9 to 1.2	.6	.5	.5	−.1	−.1	−.1	31.4	24.1	27.8	−6.5	−4.9	−7.6
Virginia	−.1 to .8	−.5 to 1.0	−.1 to .8	−.5 to 1.0	−.2 to 1.0	−.8 to 1.2	.5	.5	.6	**−.3	**−.3	**−.4	23.4	21.8	27.4	−14.5	−13.9	−17.7
West Virginia	−.6 to .8	−1.4 to 1.2	−.7 to .8	−1.4 to 1.1	−1.1 to 1.3	−2.1 to 2.5	.6	.6	1.1	.1	.1	0	37.0	37.0	50.1	5.0	4.4	.7
Southwest	−.5 to .6	−.7 to 1.4	−.4 to .5	−1.0 to .8	−.5 to .6	−1.0 to 1.0	.5	.4	.5	−.1	0	−.1	25.4	20.1	25.8	−3.2	−.4	−3.0
Arizona	−.5 to 1.4	−1.8 to 1.8	−.7 to 1.2	−1.4 to 1.5	−.9 to 1.2	−1.2 to 2.4	.9	.9	.9	−.3	−.3	*−.4	37.9	35.1	37.3	−13.1	−11.7	−16.4
New Mexico	−.4 to .6	−.9 to 1.6	−.4 to .5	−.6 to .9	−.5 to .7	−.9 to 1.0	.5	.4	.5	−.1	−.1	0	26.8	22.3	29.3	−6.8	−5.5	−2.8
Oklahoma	−1.1 to .8	−2.2 to 2.2	−.9 to .5	−2.0 to 1.4	−1.0 to .8	−1.6 to 2.3	1.0	.7	1.0	.2	.2	.2	56.9	43.6	56.2	13.2	15.6	15.3
Texas	−.6 to .6	−1.0 to 1.5	−.3 to .5	−.9 to .9	−.6 to .8	−1.0 to 1.2	.5	.4	.5	−.1	0	0	26.3	21.5	28.1	−2.8	.6	−1.5
Rocky Mountain	−.5 to .5	−1.1 to .9	−.5 to .4	−.7 to .5	−.6 to .7	−1.1 to 1.2	.5	.3	.6	.1	.1	0	30.3	20.0	37.3	3.5	3.0	−.9
Colorado	−.6 to .6	−.9 to 1.1	−.3 to .7	−.7 to 1.1	−.7 to .7	−1.3 to 1.6	.5	.4	.7	−.1	−.1	−.1	27.2	22.7	37.8	−5.3	−4.6	−7.6
Idaho	−1.0 to 1.2	−3.5 to 2.1	−1.1 to .3	−1.5 to .8	−1.3 to .8	−1.8 to 2.0	1.2	.5	.9	.2	.2	.1	64.3	37.6	70.2	15.1	15.7	5.1
Montana	−2.9 to 2.1	−4.9 to 4.2	−1.3 to 1.1	−2.2 to 1.6	−2.1 to 1.6	−3.0 to 3.0	2.2	1.0	1.5	.2	.1	0	82.5	75.8	133.8	14.1	7.8	.8
Utah	−.6 to .7	−1.0 to .9	−.7 to .6	−1.1 to 1.0	−.8 to .9	−1.3 to 1.5	.5	.5	.7	0	0	0	27.9	29.1	40.7	1.0	1.1	−1.8
Wyoming	−2.3 to 1.0	−3.6 to 2.5	−2.1 to 1.0	−3.9 to 1.5	−2.6 to 1.2	−5.4 to 3.1	1.5	1.4	1.9	*.7	*.7	.7	82.1	73.8	79.7	105.4	92.9	155.8
Far West	−.6 to 1.0	−1.2 to 1.5	−.5 to .8	−1.1 to 1.0	−.4 to .9	−.7 to 1.5	.7	.5	.6	−.1	−.1	*−.3	32.1	24.8	28.5	−7.2	−6.8	−13.3
California	−.6 to 1.1	−1.4 to 1.6	−.4 to .9	−1.0 to 1.1	−.5 to 1.1	−.6 to 1.5	.7	.6	.7	−.2	−.2	**−.4	33.5	26.3	30.4	−9.5	−9.2	−16.3
Nevada	−.6 to .6	−1.1 to .7	−.6 to .6	−1.0 to .7	−.8 to .8	−1.3 to 1.1	.6	.5	.7	.1	.1	.1	26.6	25.2	35.7	3.8	3.0	6.4
Oregon	−.8 to .5	−1.8 to 1.2	−.7 to .3	−1.2 to .8	−.9 to 1.0	−1.4 to 1.4	.6	.5	.7	.1	.2	0	41.1	33.1	52.4	9.6	10.7	1.4
Washington	−.8 to .8	−2.0 to 1.9	−.8 to .9	−1.2 to 1.1	−1.0 to .9	−1.9 to 2.2	.8	.7	.9	0	0	0	48.8	39.1	55.1	1.7	2.7	2.5
Alaska	−2.7 to 2.5	−8.4 to 7.1	−2.7 to 2.5	−8.4 to 7.1	−2.1 to 1.1	−2.7 to 3.0	2.9	2.9	1.5	.2	.2	.4	125.4	125.3	67.4	8.4	8.5	28.8
Hawaii	−.7 to 1.0	−1.8 to 2.2	−.6 to .9	−1.0 to 1.4	−.8 to .9	−1.2 to 1.7	.9	.6	.7	−.1	−.1	−.2	44.0	32.3	38.9	−5.7	−6.1	−10.4

* Significance at the 5-percent confidence level.
** Significance at the 1-percent confidence level.

Dispersion is the average of the absolute values of revision in percent changes between the preliminary and the final estimates:

$$\sum |P - F|/n$$

Bias is the average of the revisions in percent changes between preliminary and final estimates:

$$\sum (P - F)/n$$

Relative dispersion expresses the dispersion as a percent of the average of the absolute values of the final percent changes:

$$\frac{100 \sum |P - F|/n}{\sum |F|/n}$$

Relative bias expresses the bias as a percent of the average of the final percent changes:

$$\frac{100 \sum (P - F)/n}{\sum F/n}$$

CHART 1

Range of Revisions to Quarterly Changes Between Preliminary and Final Estimates of Total Personal Income

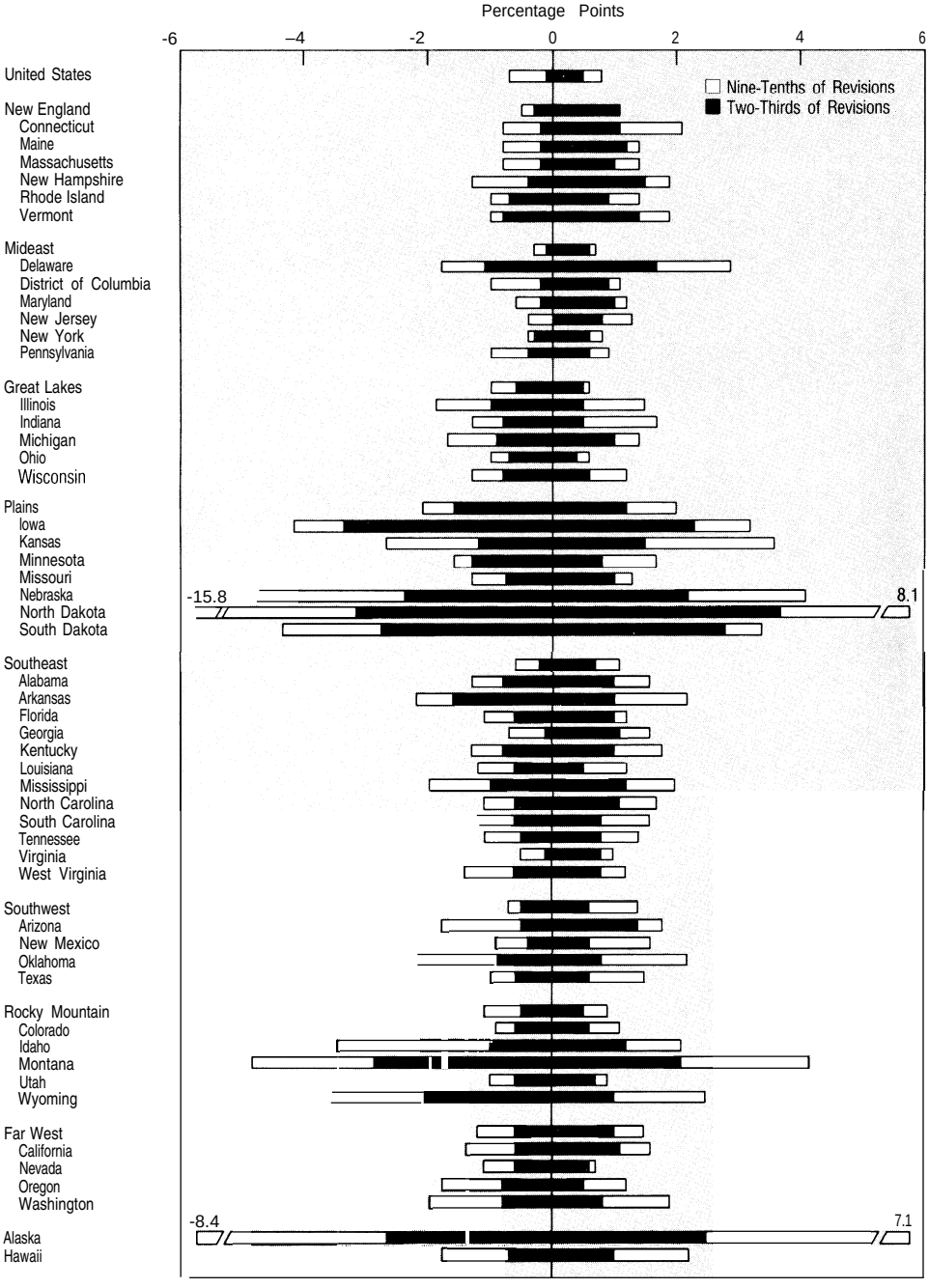

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Table 2 presents measures of the range, dispersion, bias, relative dispersion, and relative bias of the revisions between the preliminary and the final estimates of quarterly total personal income, nonfarm personal income, and wage and salary disbursements for 1980-87. It also presents the results of statistical tests of the significance of the biases for total personal income, nonfarm personal income, and wage and salary disbursements.

Preliminary quarterly estimates

Range.—The range of the revisions between the preliminary and final estimates of total personal income is largest for the States of the Plains region. Of the nine States in which the differences between the lower and upper limits for nine-tenths of the revisions exceed 5.5 percentage points, five are in the Plains region (chart 1).[4] A comparison of chart 1 with chart 2, which shows the range of revisions for nonfarm personal income, reveals that farm income is the source of much of the variation in the range of revisions among States. After removing farm income, the range of revision for all of the Plains States is below 5.5 percentage points.

For nonfarm personal income, the range of revisions exceeds 5.5 percentage points for only Alaska. Alaska has a large special transfer payment, the Alaska Permanent Fund dividend payment, that began in 1982 after the discovery and development of oil on the North Slope. The introduction in 1985 of seasonal adjustment for this payment, which amounts to 4 percent of total personal income in Alaska, led to large revisions to the estimates of total

4. For the purposes of this study, the District of Columbia is counted as a State.

personal income and nonfarm personal income for 1982-84. The revisions to the estimates of total personal income and nonfarm personal income in Alaska for 1985-87 are significantly smaller; however, they are still large relative to other States.

For wages and salaries, Delaware, Montana, Wyoming, and Alaska are the only States for which the range of revisions exceeds 5.5 percentage points (chart 3). The economies of these four "small" States are strongly influenced either by a few large companies or by volatile industries, such as mining. In addition, the income estimates for Alaska, Montana, and Wyoming have strong seasonal patterns, the adjustments for which were revised substantially during the period covered by this study.

Dispersion.—The measures of dispersion of total personal income also show the effect of the revisions to the estimates of farm income. The dispersion in the revisions for six States exceeds 2 percentage points; removing farm income reduces the number of States to one—Alaska. The relative dispersion of total personal income is more than 50 percent for 12 States (that is, for these States, the average size of the revisions exceeds 50 percent of the average quarterly change in total personal income) and is less than 30 percent for 14 States.

The relative dispersion in the revisions to the estimates of total personal income tends to be higher for "small" States and lower for "large" States. All of the 12 States with a relative dispersion of more than 50 percent ranked in the bottom half of the Nation in terms of total personal income. Of the 14 States with a relative dispersion of less than 30 percent, 10 ranked in the top half of the Nation in terms of total personal income.

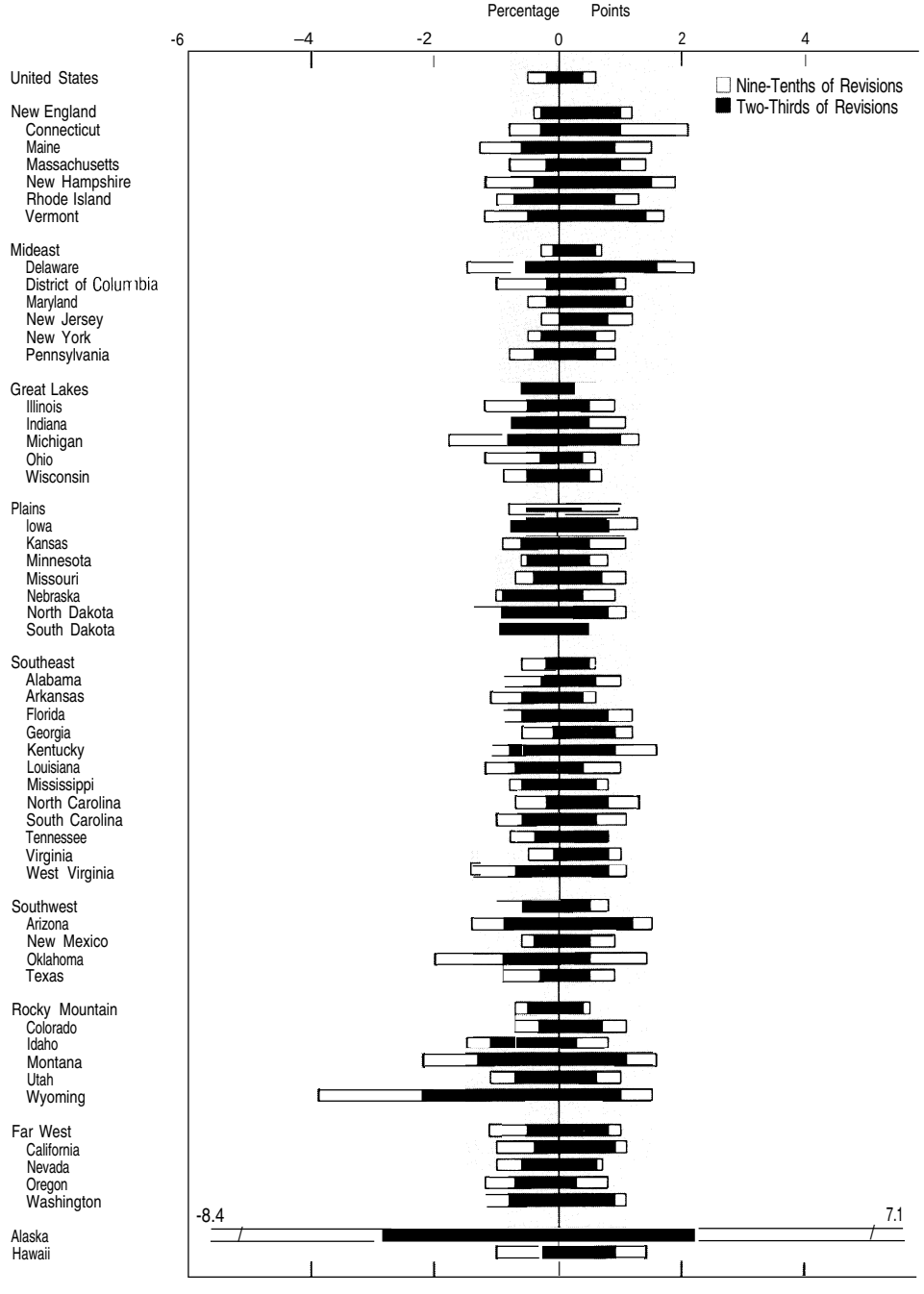
The revisions to the estimates of wages and salaries show a greater relative dispersion than do the revisions to the estimates of nonfarm personal income. For nonfarm personal income, the relative dispersion is more than 50 percent for only 6 States and is less than 30 percent for 26 States. For wages and salaries, the relative dispersion is more than 50 percent for 18 States and is less than 30 percent for only 6 States.

Bias.— The study found statistically significant bias at the 5-percent confidence level in the preliminary quarterly estimates of total personal income for 10 States. For all 10 States, the bias was negative, which indicates that the preliminary estimates were understated. This result extends through the estimates of nonfarm personal income and of wages and salaries; except for Wyoming, each State that has statistically significant bias in its estimates of total or of nonfarm personal income also has statistically significant bias in its estimates of wages and salaries.

The variation in the bias in wages and salaries is highly associated with a variation in the growth of wages and salaries. Of the 13 States with significant bias in wages and salaries, 12 States are among the top 14 States in terms of growth during 1980-87. Further, of the 21 States with the most negative bias in wages and salaries, 17 States are among the top 21 States in terms of growth. Of the 22 States

CHART 2

Range of Revisions to Quarterly Changes Between Preliminary and Final Estimates of Nonfarm Personal Income



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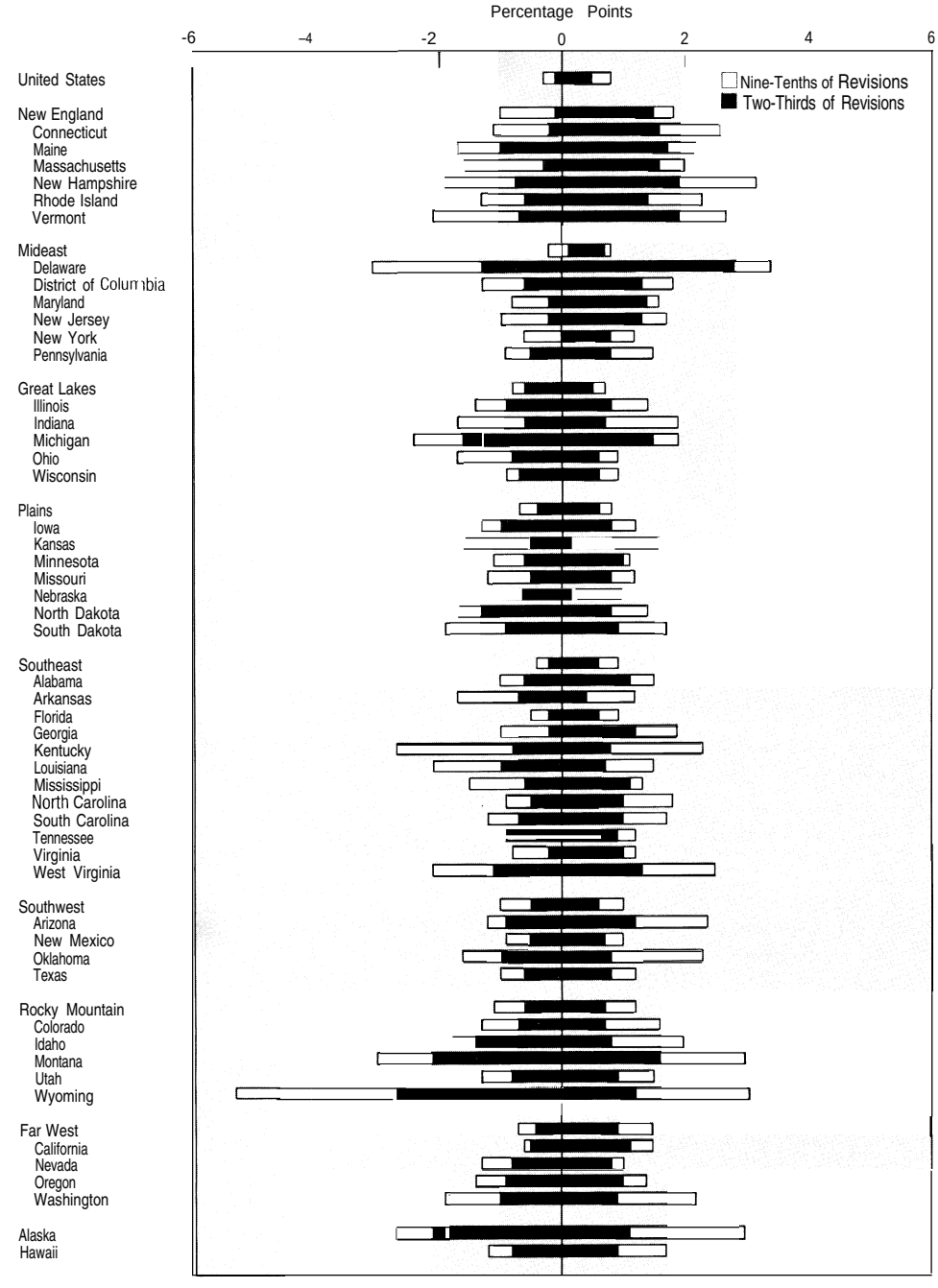
with zero or positive bias in wages and salaries, 17 States are among the bottom 22 States in terms of growth.

The direction and size of the bias in the estimates of wages and salaries vary among States and industries. The BEA coastal regions (the New England, Mideast, Southeast, and Far West regions), where fast-growing trade and service industries are concentrated, had the largest understatements in the preliminary estimates of the quarterly change in wages and salaries. Biases for all 4 coastal regions and for 18 of their 28 States were as negative as, or more negative than, –0.2 percentage point, which was the bias for the Nation. All four coastal regions had above-average wage and salary growth for 1980-87.

The BEA interior regions (the Great Lakes, Plains, Rocky Mountain, and Southwest regions), where slow-growing goods-producing industries are concentrated, had smaller understatements or had overstatements in the preliminary estimates of the quarterly change in wages and salaries. Biases for all 4 interior regions and for 19 of their 21 States were positive or were less negative than the bias for the Nation. All four interior regions had below-average wage and salary growth for 1980–87.

CHART 3

Range of Revisions to Quarterly Changes Between Preliminary and Final Estimates of Wages and Salaries



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Second quarterly estimates

During the 1980's, the quality and timeliness of the quarterly ES-202 data, which is the primary data source for wages and salaries in the final quarterly estimates of State personal income, improved significantly. Therefore, beginning with the estimates for the third quarter of 1984, the ES-202 wage and salary data were incorporated into the second estimates 7 months after the end of the quarter. Before then, the ES-202 data had been incorporated into the quarterly estimates twice a year with a lag of 10 months.

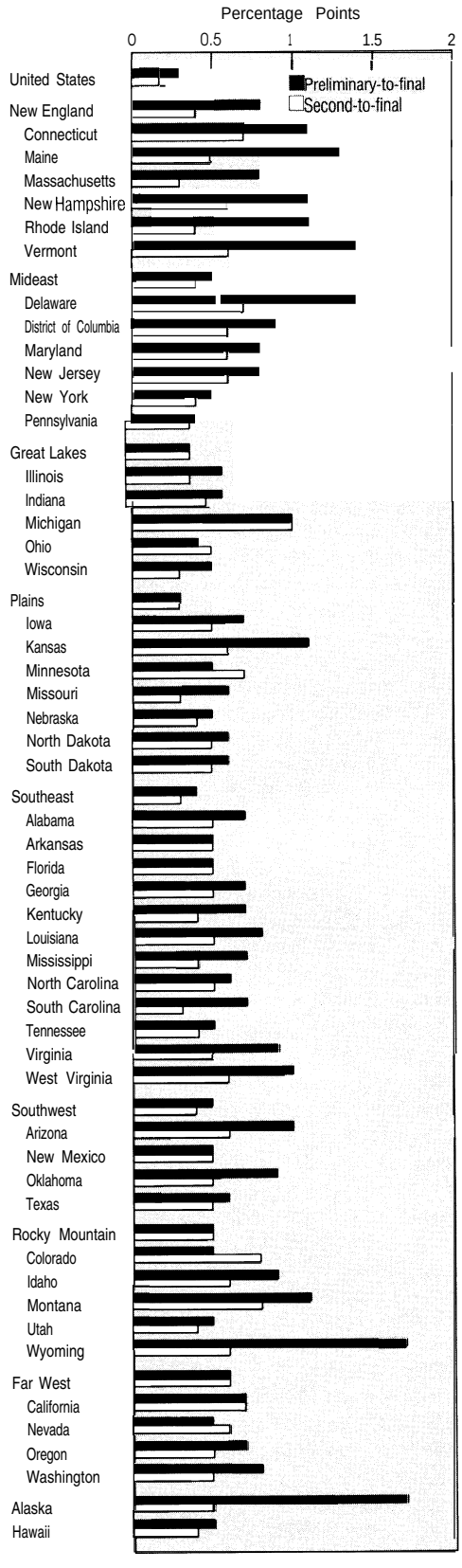
Table 3 presents measures of the dispersion, bias, relative dispersion, and relative bias in the revisions to the preliminary-to-final and second-to-final estimates of quarterly total personal income, nonfarm personal income, and wages and salaries for 1984-87, the period in which the ES-202 data were incorporated into the second estimates. It also presents the results of statistical tests of the significance of the biases for total personal income, nonfarm personal income, and wages and salaries.

Dispersion.—Most States show a reduction in the size of the revisions to the estimates of wages and salaries that resulted from the incorporation of the quarterly ES-202 data into the second estimate. From the preliminary estimate to the final estimate, the dispersion in the revisions for 13 States is greater than or equal to 1 percentage point; from the second estimate to the final estimate, the dispersion for all States except Michigan is less than 1 percentage point (for Michigan, it is 1 percentage point)(chart 4).

Although the incorporation of wages and salaries is the most important difference between the preliminary and second estimates, farm income is also subject to some revision between these estimates. The effect of these revisions is apparent in table 3, where for some farm-oriented States the differences between the preliminary-to-final

CHART 4

Dispersion in Wages and Salaries 1984:3 to 1987:4



Note. –Percentage points calculated from quarterly percent change.

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and second-to-final total personal income dispersions are greater than can be attributed to differences in wages and salaries alone.

Bias.—The bias in the second quarterly estimates of total personal income is similar to that found in the preliminary quarterly estimates. Statistically significant negative bias at the 5-percent confidence level, present in the preliminary estimates for 23 States, is present in the second estimates for 19 States. There is some evidence that the bias in the second estimates is not as extreme as in the preliminary estimates. In the preliminary-to-final revisions, the bias in wages and salaries for 13 States is equal to or less than –0.6 percentage point, and the bias for 7 States is equal to or greater than 0.2 percentage point. In the second-to-final revisions, the biases for all States except Alaska fall between –0.6 and 0.2 percentage point.

An important factor limiting the improvement in the reliability of the estimates achieved by the introduction of the ES-202 data into the State wage and salary estimates is that the second estimate of wages and salaries is controlled to NIPA estimates that have not yet incorporated the ES-202 data.

Table 3.—Measures of Revisions in Quarterly Percent Changes in State Personal Income, 1984: III-1987:IV

[Percentage points]

	Preliminary to final						Second to final					
	Dispersion			Bias			Dispersion			Bias		
	Total personal income	Nonfarm personal income	Wages and salaries	Total personal income	Nonfarm personal income	Wages and salaries	Total personal income	Nonfarm personal income	Wages and salaries	Total personal income	Nonfarm personal income	Wages and salaries
United States	**0.3**	**0.3**	**0.3**	****–0.3**	****–0.3**	****–0.3**	**0.3**	**0.3**	**0.3**	****–0.3**	****–0.3**	****–0.3**
New England	**.6**	**.6**	**.8**	****–.6**	****–.6**	****–.7**	**.3**	**.3**	**.4**	****–.3**	****–.3**	**–.2**
Connecticut	.7	.7	1.1	**–.6	**–.6	*–.9	.4	.4	.7	*–.3	*–.3	–.4
Maine	.7	.8	1.3	*–.5	*–.5	–.7	.4	.3	.5	–.2	–.2	–.1
Massachusetts	.7	.7	.8	**–.5	**–.5	*–.7	.3	.4	.3	*–.2	*–.2	–.2
New Hampshire	.9	.9	1.1	**–.7	**–.7	*–.8	.5	.5	.6	*–.3	*–.4	–.2
Rhode Island	.7	.7	1.1	*–.5	*–.5	**–.8	.3	.3	.4	–.2	–.2	–.2
Vermont	1.0	.9	1.4	**–.8	**–.8	*–.9	.4	.4	.6	–.2	*–.2	–.1
Mideast	**.4**	**.4**	**.5**	****–.4**	****–.4**	****–.5**	**.3**	**.3**	**.4**	****–.3**	****–.3**	****–.3**
Delaware	1.0	.9	1.4	**–.9	**–.8	–.7	.6	.6	.7	–.4	*–.5	–.1
District of Columbia	.6	.6	.9	**–.6	**–.6	–.5	.6	.6	.6	**–.5	**–.5	*–.5
Maryland	.7	.7	.8	**–.7	**–.7	**–.8	.5	.5	.6	**–.5	**–.5	*–.5
New Jersey	.5	.5	.8	**–.5	**–.5	*–.6	.5	.5	.6	–.3	–.3	–.2
New York	.4	.4	.5	*–.3	*–.3	**–.4	.3	.3	.4	–.2	–.2	**–.3
Pennsylvania	.4	.4	.4	**–.4	**–.4	–.3	.3	.4	.4	**–.3	**–.4	*–.2
Great Lakes	**.2**	**.2**	**.4**	***–.2**	***–.2**	**–.2**	**.3**	**.3**	**.4**	***–.2**	****–.2**	****–.3**
Illinois	.4	.4	.6	–.2	*–.2	–.3	.5	.4	.4	–.2	**–.3	**–.3
Indiana	.5	.4	.6	–.2	–.1	–.1	.5	.4	.5	–.1	–.1	0
Michigan	.6	.6	1.0	–.2	–.2	–.4	.6	.6	1.0	–.3	–.4	–.5
Ohio	.2	.3	.4	–.1	0	0	.3	.3	.5	–.1	–.2	–.2
Wisconsin	.6	.3	.5	–.3	–.2	–.2	.6	.2	.3	–.2	**–.2	*–.2
Plains	**.7**	**.3**	**.3**	**–.3**	**–.2**	**–.2**	**1.0**	**.3**	**.3**	**–.3**	****–.3**	****–.3**
Iowa	1.8	.6	.7	–.2	–.1	–.1	1.9	.4	.5	–.1	–.2	–.2
Kansas	1.0	.6	1.1	–.3	–.2	–.1	1.0	.5	.6	–.5	**–.4	**–.5
Minnesota	.7	.4	.5	–.2	–.2	–.2	.8	.5	.7	–.4	**–.4	**–.5
Missouri	.5	.5	.6	*–.4	*–.3	–.3	.4	.3	.3	**–.4	**–.3	**–.3
Nebraska	1.4	.4	.5	0	.1	.1	1.8	.5	.4	.2	.1	.1
North Dakota	3.0	.6	.6	–.3	.1	.3	2.8	.4	.5	–.6	–.1	–.1
South Dakota	1.7	.4	.6	–.7	–.2	–.2	2.3	.5	.5	–.4	–.1	–.1
Southeast	**.5**	**.4**	**.4**	****–.4**	****–.4**	****–.4**	**.4**	**.3**	**.3**	****–.3**	****–.3**	****–.2**
Alabama	.6	.5	.7	**–.6	**–.5	**–.6	.5	.4	.5	*–.3	**–.3	*–.3
Arkansas	1.1	.4	.5	–.5	–.1	0	.8	.3	.5	–.3	*–.3	–.2
Florida	.7	.6	.5	**–.6	**–.5	*–.4	.6	.6	.5	*–.5	**–.6	**–.4
Georgia	.7	.6	.7	**–.6	**–.6	**–.6	.5	.4	.5	*–.4	**–.4	–.3
Kentucky	.6	.7	.7	–.1	0	.0	.5	.4	.4	–.1	–.1	–.1
Louisiana	.5	.5	.8	.0	.1	.3	.5	.4	.5	–.1	–.1	.0
Mississippi	.7	.5	.7	–.2	–.1	0	.6	.3	.4	–.2	–.2	–.1
North Carolina	.6	.5	.6	**–.6	**–.5	**–.5	.4	.3	.5	–.2	*–.2	–.2
South Carolina	.5	.5	.7	–.2	–.2	0	.3	.2	.3	*–.2	**–.2	–.1
Tennessee	.5	.5	.5	*–.3	–.3	–.2	.3	.3	.4	**–.3	**–.3	*–.2
Virginia	.7	.6	.9	**–.6	**–.6	**–.7	.4	.4	.5	*–.3	**–.3	–.3
West Virginia	.5	.5	1.0	–.1	–.2	–.2	.2	.2	.6	–.1	–.1	–.1
Southwest	**.5**	**.4**	**.5**	**–.1**	**0**	**.2**	**.5**	**.4**	**.4**	**–.2**	***–.2**	**–.2**
Arizona	.8	.8	1.0	*–.6	*–.6	–.5	.6	.6	.6	**–.5	**–.5	–.4
New Mexico	.4	.4	.5	–.3	–.3	0	.6	.5	.5	**–.5	**–.5	**–.4
Oklahoma	.8	.7	.9	.3	.3	.4	.6	.5	.5	–.2	–.1	–.2
Texas	.6	.5	.6	0	.1	.3	.5	.4	.5	–.2	–.2	–.2
Rocky Mountain	**.4**	**.3**	**.5**	**0**	**0**	**.2**	**.4**	**.3**	**.5**	**–.2**	**–.1**	**–.1**
Colorado	.3	.3	.5	0	0	.2	.5	.4	.8	–.1	–.1	0
Idaho	.9	.4	.9	–.4	–.1	–.1	.8	.3	.6	–.2	–.1	–.1
Montana	1.4	.7	1.1	–.2	0	.1	1.0	.5	.8	–.7	0	.1
Utah	.4	.4	.5	0	0	.1	.3	.3	.4	**–.3	**–.3	–.3
Wyoming	1.5	1.5	1.7	.6	.6	.7	.7	.6	.6	0	.1	–.2
Far West	**.5**	**.5**	**.6**	****–.5**	****–.4**	****–.5**	**.5**	**.4**	**.6**	****–.4**	****–.4**	**–.3**
California	.6	.5	.7	**–.5	**–.5	**–.6	.5	.5	.7	*–.4	**–.4	–.3
Nevada	.4	.5	.5	**–.4	**–.4	–.2	.5	.5	.6	**–.4	**–.4	–.3
Oregon	.4	.4	.7	–.2	–.1	–.1	.4	.3	.4	*–.3	**–.2	*–.3
Washington	.6	.6	.8	–.3	–.2	–.1	.5	.3	.5	–.3	**–.3	–.2
Alaska	3.7	3.7	1.7	.6	.6	*1.3	2.6	2.5	.5	.5	.5	.3
Hawaii	.7	.6	.5	*–.5	*–.4	*–.4	.4	.4	.4	–.3	–.3	–.2

* Significance at the 5-percent confidence level.
** Significance at the 1-percent confidence level.

The annual ES-202 data are not incorporated into the annual and quarterly NIPA estimates until July. Therefore, the bias in the quarterly NIPA estimates of wages and salaries continues to affect the second State estimates even after the ES-202 data are incorporated into the State estimates. For this reason, the biases in the second-to-final revisions are negative for most of the regions and States. In none of the 19 States in which the bias is statistically different from zero is it also statistically different from the bias for the Nation.

Preliminary annual estimates

Many applications of the State personal income estimates are based on the annual estimates. The initial annual estimates that can be used for such purposes—whether for a calendar year or a fiscal year—are derived as the sum of the quarterly estimates. Table 4 shows the measures of revisions between the preliminary annual estimates and the final annual estimates that were available when the study began.

For 1980-87, the relative revisions between the preliminary annual estimates and the final annual estimates are smaller than the relative revisions between the preliminary quarterly estimates and the final quarterly estimates shown in table 2. Only 3 States, all in the Plains region, have a relative dispersion in total personal income of 30 percent or more; 16 States have a relative dispersion of less than 10 percent. The revisions in the annual estimates are smaller for three main reasons: (1) State ES-202 wage and salary data for three quarters are incorporated into the preliminary annual estimates for most of the period, (2) State annual data on farm proprietors' income are incorporated into the preliminary annual estimates, and (3) annual estimates are not affected by seasonal adjustments.

Recent Developments

Beginning with the preliminary annual estimates for 1989 published in the April 1990 SURVEY, BEA stopped controlling the annual estimates for the most current year to the BLS-790-based U.S. totals for wages and salaries in the NIPA's. The U.S. totals for wages and salaries now used for the preliminary annual State estimates are based on ES-202 data for three quarters. This methodological change is expected to reduce the revisions between the preliminary and final annual estimates of total personal income.

In addition, new procedures to deal with changes in seasonal payment patterns were used in the April 1990 estimates of wages and salaries for the service industry and in the October 1990 estimates for the finance, insurance, and real estate industries. In recent years, lump-sum payments in these industries have been unusual both in size and in timing; these payments, by significantly affecting the quarterly seasonal pattern of the wage and salary estimates, have made the existing seasonal factors less reliable. In the service industry, the size and the timing of lump-sum payments paid by personal service corporations to their owner-employees has changed in recent years, reflecting provisions of the Tax Reform Act of 1986 and the Revenue Act of 1987. In the finance, insurance, and real estate industries, the amount of lump-sum payments to security and commodity brokers has also changed, for a variety of reasons: The slowdown in brokerage business after the stock market crash of October 1987, the reduction in the number of mergers and acquisitions of companies, and the reduction in demand for new issues of high-yield bonds. As a result of these developments, the revisions to the 1988 and 1989 preliminary and second estimates were larger than normal. If the size and timing of lump-sum payments stabilize, the size of revisions for years after 1989 can be expected to be similar to those for 1984-87.

Table 4.—Measures of Revisions in Annual Changes in State Personal Income for 1980–87

[Revisions are from preliminary to final]

	Percentage points		Percent	
	Dispersion	Bias	Relative dispersion	Relative bias
United States	**0.5**	**–0.3**	**6.5**	**–3.9**
New England	**.7**	**–.7**	**7.3**	**–7.3**
Connecticut	.7	–.6	7.2	–6.8
Maine	.7	–.6	7.8	–6.1
Massachusetts	.7	–.7	7.8	–7.8
New Hampshire	1.5	–1.2	13.4	–11.0
Rhode Island	.6	–.3	6.7	–3.5
Vermont	1.2	–.5	13.7	–5.3
Mideast	**.5**	**–.4**	**5.7**	**–4.8**
Delaware	1.1	–.7	12.5	–8.3
District of Columbia	1.8	.3	25.2	4.5
Maryland	.9	–.9	9.9	–9.5
New Jersey	1.0	–1.0	10.7	–10.7
New York	.6	–.1	6.8	–1.3
Pennsylvania	.8	–.3	12.2	–4.0
Great Lakes	**.6**	**0**	**10.1**	**–.2**
Illinois	1.0	.4	15.4	6.5
Indiana	1.2	0	18.6	0
Michigan	1.4	–.5	23.2	–7.6
Ohio	.7	.1	10.7	1.9
Wisconsin	.7	–.5	10.7	–8.2
Plains	**.9**	**–.1**	**12.4**	**–.8**
Iowa	1.9	.1	34.4	2.1
Kansas	1.3	.1	18.8	1.5
Minnesota	.8	–.5	10.4	–6.7
Missouri	.7	–.2	8.8	–2.2
Nebraska	1.6	0	25.0	.1
North Dakota	2.5	1.9	40.4	31.1
South Dakota	2.0	1.0	32.9	15.7
Southeast	**.8**	**–.5**	**8.9**	**–6.0**
Alabama	.7	–.2	8.7	–3.1
Arkansas	1.0	–.5	13.6	–6.8
Florida	1.6	–.7	14.6	–6.1
Georgia	.8	–.8	8.2	–7.5
Kentucky	1.0	–.4	15.5	–6.2
Louisiana	.7	–.1	11.8	–2.1
Mississippi	.7	.1	10.2	1.5
North Carolina	.8	–.8	8.5	–8.5
South Carolina	.9	–.3	9.9	–3.7
Tennessee	.7	–.2	9.0	–2.6
Virginia	.6	–.6	6.5	–6.5
West Virginia	.9	–.3	17.4	–6.1
Southwest	**.5**	**–.1**	**6.1**	**–1.7**
Arizona	1.2	–.7	11.3	–6.4
New Mexico	1.0	–.6	12.3	–7.4
Oklahoma	1.4	–.4	21.3	–6.2
Texas	.4	0	5.2	.4
Rocky Mountain	**.4**	**–.2**	**5.0**	**–2.4**
Colorado	1.0	–.6	11.7	–6.6
Idaho	1.1	.3	17.5	4.1
Montana	1.5	.6	25.9	10.6
Utah	.5	–.3	6.4	–4.4
Wyoming	1.1	.7	18.4	18.3
Far West	**.7**	**–.3**	**7.6**	**–3.5**
California	.6	–.3	7.1	–2.9
Nevada	1.2	–.7	12.9	–6.9
Oregon	.8	.1	13.4	2.4
Washington	.9	–.6	12.4	–7.8
Alaska	1.6	–1.5	17.1	–17.9
Hawaii	1.7	–.3	20.5	–3.9